CLAIMS

What is claimed as the invention is:

1. A cell population cultured in vitro, in which at least ~60% cells have the same genome as an established line of primate embryonic stem cells, and that have at least three of the following characteristics:
    - antibody-detectable expression of α_1-antitrypsin (AAT);
    - antibody-detectable expression of albumin;
    - absence of antibody-detectable expression of α-fetoprotein;
    - RT-PCR detectable expression of asialoglycoprotein receptor (ASGR);
    - evidence of glycogen storage;
    - evidence of cytochrome p450 activity;
    - evidence of glucose-6-phosphatase activity; and
    - the morphological features of hepatocytes.

2. The cell population of claim 1, wherein at least about 60% of the cells have at least five of said characteristics.

3. The cell population of claim 1, wherein at least about 80% of the cells have at least seven of said characteristics.

4. The cell population of claim 1, wherein the level of cytochrome p450 enzyme 1A1/1A2 activity is at least as high as in primary human adult hepatocytes.

5. The cell population of claim 1, which has been genetically altered to express telomerase at an elevated level.

6. A method for obtaining the cell population of claim 1, comprising culturing cells from the stem cell line in a growth environment that comprises a hepatocyte differentiation agent which is a histone deacetylase inhibitor.

7. The method of claim 6, wherein the hepatocyte differentiation agent is n-butyrate.

8. A method for obtaining the cell population of claim 1, comprising culturing cells from the stem cell line in a growth environment that comprises one or more hepatocyte maturation factors that are either:

a) an organic solvent selected from dimethyl sulfoxide (DMSO), dimethylacetamide (DMA); hexmethylene bisacetamide, and other polymethylene bisacetamides; or

b) a cytokine or hormone selected from glucocorticoids, epidermal growth factor (EGF), insulin, TGF-α, TGF-β, fibroblast growth factor (FGF), hepatocyte growth factor (HGF), IL-1, IL-6, IGF-I, IGF-II, and HBGF-1.

9. An isolated cell having at least three of the characteristics listed in claim 1, which is either harvested from the cell population of claim 1, or is the progeny of such a cell.

10. A method of screening a compound for hepatocellular toxicity, comprising combining a cell according to claim 1 with the compound, and determining whether the compound is toxic to the cell.

11. A method of screening a compound for its ability to modulate hepatocellular function, comprising combining a cell according to claim 1 with the compound, determining any phenotypic or metabolic changes in the cell that result from contact with the compound, and correlating the change with an ability to modulate hepatocellular function.

12. The method of claim 11, comprising determining whether the compound changes enzyme activity or secretion by the cell.